



Taxonomic notes on the genus *Hypocala* Guenee (Lepidoptera: Noctuidae) of the Nilgiri Biosphere, India

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ABSTRACT

From the investigations carried out on the Noctuidae during 2009-2011 in the Nilgiri Biosphere of Tamilnadu, six species of the genus *Hypocala* were studied. Among them, *H. violacea* Guenee was reported for the first time from the Nilgiri. Photographic illustrations of the male and female genitalia of all the known species of this moth are presented.

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Keywords

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New record,
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Male and Female genitalia.

Introduction

Blue Mountains Nilgiris are situated in the present district of Nilgiri of Tamilnadu part of Western Ghats, Southern India. Noctuidae fauna of the Nilgiri have been known to have 89 species as recorded by Hampson in 1894 & 1895. For the present study, surveys were undertaken during 2009-2011 at all seasons.

Genus *Hypocala* Guenee (1852) belonging to the subfamily Hypocalinae, was established with six species, *H. subsatura* Guenee, *H. deflorata* Fabricius, *H. moorei* Butler, *H. violacea*, Butler, *H. biarcuata* Walker and *H. lativitta* Moore. Hampson (1894) placed the genus in subfamily Ophiderinae. The quadrifine subfamilies treated as (Herminiinae, Hypenodinae, Hypeninae, Catocalinae, Calpinae, Stictopterinae, and Euteliinae) as subfamilies of the re-established family Erebidae and as the sister group to the arctiid families and reinstating subfamily Rivulinae following Fibiger and Hacker (1991), Speidel *et al.* (1996). Fibiger and Lofontaine (2005) arranged the quadrifid (Forewing) group in several families, including the quadrifine (Hindwing) Erebidae and trifine (Hindwing) Noctuidae, based on evidence that suggested that the trifine noctuid were derived from within the quadrifine subfamilies, so the family Erebidae would not be strictly monophyletic. The higher taxonomy of the Noctuoidea has been changed radically the distinction of the family rank taxa is still debatable. The Catocalinae trunk is placed most recently as a tribe of the subfamily Erebininae within the broadly defined family Erebidae (Lofontaine & Schmidt, 2010). In the present study follows a more traditional concept and consider this phyletic group as a subfamily Catocalinae.

The known species are hardly distinguishable from each other due to similar wing patterns. However they can be

separated by genital characters. This paper deals with the distinct characteristic of each species of genus *Hypocala*.

Materials and Methods

Materials examined in the present study are based on the taxonomic study of Noctuidae moths from Nilgiri Biosphere. Moths were collected from four different sites namely Coonoor, Ooty, Doddabedda (Benchmark) and Kothagiri. Moths were collected with artificial light source. The collected specimens were immobilized using Ethyl acetate. The dead specimens were set and spread on spreading board. Properly dried specimens were labeled and stored in collection boxes.

For genitalia studies the abdomen was dissected from the specimen and placed in a 10% solution of Potassium hydroxide (KOH) and the same was gently boiled in a water bath and transferred to a watch glass. The dissection of genitalia was done with the help of a pair of fine needles under a Labomed Zoom stereo trinocular microscope model Zm 45 TM. The body contents, mostly the non sclerotized tissue, were removed by pressing with a needle or brush from the anterior end of the abdomen. The external genitalia which can be clearly seen were separated out. The genitalia were mounted on a slide using Canada balsam. The genitalia diagrams were made by using mirror type camera lucida.

Results and Discussion

The genus is characterized by the palpi rostriform, porrect, triangularly scaled. forewing with the costa slightly arched towards apex which is rectangular.

From the investigations of the Noctuidae of the Nilgiri Biosphere, six species of the genus *Hypocala* were recognized. *H. deflorata* Fabricius, *H. rostrata* Fabricius, *H. biarcuata* Walker, *H. lativitta* Moore and *H. violacea* Butler and *H. subsatura* Guenee. Of them, *H. violacea* was reported for the first time from the Nilgiri biosphere.

Systematic Accounts

Hypocala rostrata Fabricius, 1794

Hypocala rostrata Fabricius, 1794, *Ent. Syst.*, 3 (2) : 127.

Hypocala plumicornis Guenee, 1852, *Noct.*, iii.

Hypocala efflorescens Guenee, 1852, *Noct.*, iii.

Material Examined:

Tamilnadu (INDIA): Nilgiri District, Coonoor, 7. x. 2009, 4 ex. ; Doddabedda, 8. x. 2009, 2 ex. ; Coonoor, 15. v. 2010, 8 ex. ; Kothagiri, 16. v. 2009, 3 ex. ; Coonoor, 8. xii. 2010, 2 ex.

Diagnosis: Wingspan 36-38 mm, forewing length 16-17 mm. This species is superficially similar to *H. subsatura* which is distributed in northwest Himalaya but can be distinguished by head and thorax which is paler. Hindwing orange, not conjoined to a large spot in end of cell and with a marginal orange spot near anal angle. (Fig. 1)

Male genitalia: Uncus fringed with hairs. Tegumen broad. Vinculum long 'V' shaped with narrow arms. Valvae short and stumpy; cucullus broad, clothed with hairs. Harpe spine-like sclerotized, clasper rod-like. Juxta rectangular, cup shaped. Aedeagus long narrow, cornuti rod-like and pointed. (Fig. 1a, 1b)

Female genitalia: Ovipositor lobes triangular. Both pairs of apophyses well developed. Anterior apophysis stronger than posterior apophysis and equal length. Ductus bursae long and slender. Corpus bursae spherical; signum present on the apical and distal part. (Fig. 1c).

Hypocala biarcuata Walker, 1816

Hypocala biarcuata Walker, 1858, *Cat.*, xv: 1816; Hampson, 1894, *Faun. Brit. Ind.*, ii : 454.

Material Examined:

Tamilnadu (INDIA): Nilgiri District, Coonoor, 1. i. 2010, 4 ex. ; 8. xii. 2010, 5 ex. Doddabedda 22.iv.2009, 4ex. ; 18.vi.2010, 6ex.

Diagnosis: Wingspan 45 mm, forewing length 18 mm. Head and thorax, forewing pale brown irrorated with black dots; abdomen yellowish, the penultimate segment black, with pale anal tuft. Forewing with a submarginal black line arising from outer margin below the apex, touching centre and inner margin. Hindwing orange with marginal black band, broad at costa, and narrowing to anal angle, cilia pale. Both wings underside yellow, the costal areas ochreous and speckled with brown; the submarginal black band not reaching costa; forewing with cell-spot. (Fig. 2)

Male genitalia: Uncus fringed with hairs, stout, stalk having apical beak-like part and sclerotized. Tegumen short and broad. Vinculum long, 'V' shaped saccus conical. Valvae simple; cucullus blunt; remaining part of valvae uniformly sclerotized and well differentiated. Juxta membranous. Aedeagus rather long and stout. (Fig. 2a, 2b)

Female genitalia: Ovipositor lobes slightly inferior, triangular with setose. Both pairs of apophysis well developed. Anterior apophysis hardly longer than posterior apophysis with spatulate tip. Ductus bursae long. Bursae copulatrix elongate membranous with fine wrinkles. Signum represents a narrow sclerotized band. (Fig. 2c)

Hypocala deflorata Fabricius, 1794

Hypocala deflorata Fabricius, 1794, *Ent. Syst.*, iii : 472.

Hypocala rostrata Fabricius, 1775, *Syst. Ent.*, iii : 2, 127.

Hypocala plumicornis Guenee, 1852, *Noct.*, iii: 75.

Hypocala angulipalpis Guenee, 1852, *Noct.*, iii: 77.

Hypocala efflorescens Guenee, 1852, *Noct.* iii: 77.

Hypocala deflorata Fabricius; Hampson, 1894, *Faun. Brit. Ind.*, ii: 453; Ronkay, 2001, *Ins. Kor.*, 7: 167, pl. 27.

Material Examined:

Tamilnadu (INDIA): Nilgiri District, Coonoor, 29. xi. 2009, 2 ex. ; 9. iv. 2010, 6 ex. ; 22. x. 2010, 4 ex. ; 8. xii. 2010, 4ex. Kothagiri, 21.iv.2009, 3 ex. ; 19.v.2009, 2ex.

Diagnosis: Wingspan 47mm, forewing length 20 mm. Head and thorax, forewing pale grey. Forewing with submarginal brown double line filled with whitish but indistinct arising from outer margin below the apex and angled outwards to the margin. Hindwing with orange area larger; the marginal black area reduced and the two orange spots conjoined. Underside with black on forewing reduced to two bars, and that on hind wing also much reduced; hindwing with the cell spot. (Fig. 3)

Male genitalia: Uncus bifurcated, fringed with hairs. Tegumen broad. Vinculum 'V'-shaped with narrow arms. Valvae short; cucullus triangular shaped; costa and sacculus well differentiated. Harpe spine-like sclerotized. Juxta bowl-shaped with raised margin. Aedeagus of moderate length, slender and slightly constricted into apical region; vesica bearing a short spine like cornuti. (Fig. 3a, 3b)

Female genitalia: General aspect elongate ovipositor lobes inferior, clothed with hairs. Both pairs of apophyses strongly developed; anterior apophysis longer than posterior apophysis with spatulate tip. Ductus bursae very long and broad. Bursae copulatrix membranous, broad, oval and fine wrinkles. Signum ribbon-like. (Fig. 3c).

Hypocala lativitta Moore, 1877

Hypocala lativitta Moore, 1877, *P.Z.S.*, 606; Hampson, 1894, *Faun. Brit. Ind.*, ii : 454.

Material Examined:

Tamilnadu (INDIA): Nilgiri District, Coonoor, 8. xii. 2010, 1 ex. Doddabedda, 23.iv.2009, 2ex.

Diagnosis: Wingspan 41 mm, forewing length 18 mm. Head, thorax pale brown, irrorated with black dots forewing dark, with large patches of grey suffusion on inner area and on costa before apex; the submarginal line much less regular, and broken by diffused brown patches and black streaks at apex and centre. Abdomen with small black tuft on proximal segment. Underside of hindwing with black cell-spot, prominent. (Fig. 4)

Male genitalia: Uncus broad fringed with hairs, composed of a curved terminal lobe and having a subapical beak-like part. Genital capsule elliptical, tegumen broad, without penicular lobe. Vinculum 'V' shaped with narrow arms. Valvae symmetrical short; cucullus broad, flat and clothed with hairs; costa and sacculus well differentiated; sacculus narrow and heavily sclerotized. Juxta sclerotized and basket-shaped. Aedeagus stout and rod-like cornuti. (Fig. 4a, 4b)

Female genitalia: Not studied.

Hypocala violacea Butler, 1879

Hypocala violacea Butler 1879, *Trans. Ent.Soc. Lon*, 1879: 6.

Hypocala clarissima Butler, 1892, *Ann. Mag. Nat. Hist.* (6), 10: 21.

Hypocala kebeae Bethune-Baker, 1906, *Novit, Zool*, 13: 249.

Hypocala violacea Butler; Holloway, 1976: 35

Material Examined:

Tamilnadu (INDIA): Nilgiri District, Coonoor, 29. xi. 2009, 6 ex. ; 9. iv. 2010, 17 ex. ; 22. x. 2010, 7 ex. ; 8. xii. 2010, 2ex. Doddabedda 22.iv.2009, 10 ex. ; 12.v.2010, 7ex.

Diagnosis: Wingspan 35-46mm, forewing 22-16 mm Head, thorax and forewing being uniform red-brown, irrorated with

dark specks. Hindwing orange, the costal area black brown. Underside with the black marking on forewing reduced to two bars and those on hindwing marking to a small cell spot and bar towards anal angle. (Fig. 5)

Male genitalia: Uncus long, fringed with hairs. Tegumen well developed, broad and longer than the vinculum. Juxta highly sclerotized. Valvae broad and short. Harpe spine like and sclerotized. Vinculum short and 'U' shaped. Aedeagus moderate length; slightly curved, vesica with spine like cornuti. (Fig. 5a, 5b)

Female genitalia: Ovipositor lobes prominent. Both pairs of apophysis strongly developed; anterior apophysis much longer than the posterior apophysis. Ductus bursae long and broad. Bursae copulatrix membranous and oval in shape. Signum absent. (Fig. 5c).

Hypocala subsatura Guenee, 1852

Hypocala subsatura Guenee, 1852, *Hist. Nat. Insects, Spec. gen. Lepid.* 7 : 75.

Hypocala aspersa Butler, 1883, *Proc. zool. Soc. Lond.*, 1883: 164.

Hypocala subsatura var. *limbata* Butler, 1889, *Illust. typical Specimens lepid. Heterocera Colln Br. Mus.*, 7: 76.

Hypocala subsatura Guenee; Holloway, 1976: 35.

Material Examined:

Tamilnadu (INDIA): Nilgiri District, Coonoor, 12. iv. 2009, 3 ex.; 22. v. 2009, 2 ex Doddabedda, 13.iv.2009, 5ex; Ooty 20.v.2010, 4ex, 19.vi.2010, 1 ex.

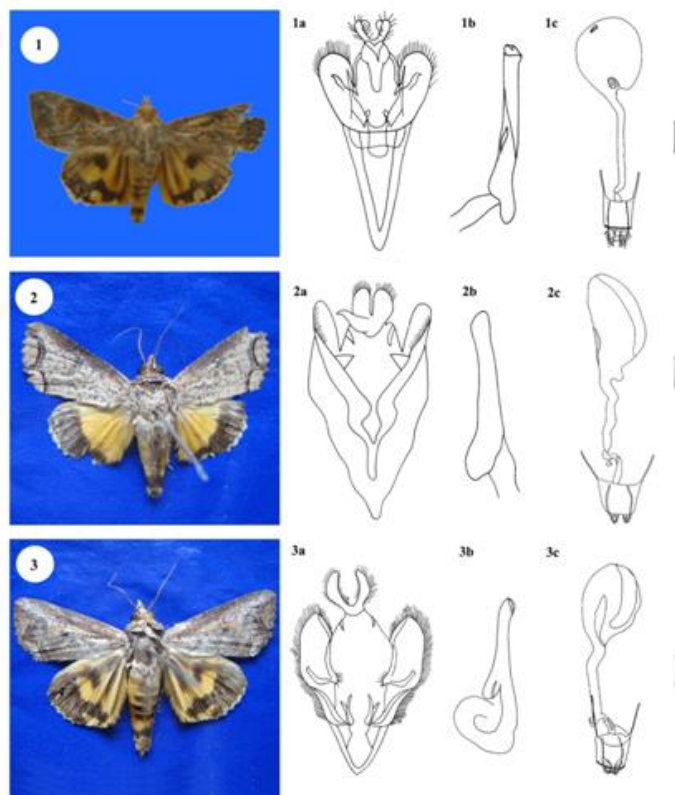
Diagnosis: Wingspan 37mm, forewing length 18mm. Head and thorax dark violaceous grey; abdomen orange, with broad black band above. Forewing dark violaceous grey; a dark spot at the base; an antemedial wavy line, angled dark lunule; the postmedial line sinuous, highly excurved beyond the cell, then bend inwards to below double line filled in with whitish, arising from the outer margin below apex and angled outwards to the margin at median. Hindwing orange, the coastal area black brown, conjoined to a large spot in end of cell, the outer area black brown, angled inwards at cubitus, and with a sub marginal orange spot at centre and a small marginal spot near anal angle the cilia orange. Underside orange; the coastal and apical areas of forewing and costa of hindwing ochreous and brown speckled; disk of forewing black, with a large yellow spot; hindwing with large cell-spot; the outer area marked as above. (Fig. 6)

Male genitalia: Uncus short, broad, apically pointed and dorsally bifid with strong setose. Tegumen short and broad; vinculum 'V' shaped and much broad. Valvae broad and somewhat triangular; harpi blend and stout. Sacculus weak. Aedeagus long and slender; vesica bearing a rod-like cornuti and expansive thin stick like structure. (Fig. 6a, 6b)

Female genitalia: Ovipositor lobes inferior clothed with hairs. Both pairs of apophyses well developed; posterior apophysis slender; anterior apophysis short with spatulate tip. Ductus bursae long and broad. Bursae copulatrix membranous, rectangular. Signum circular in shape. (Fig. 6c).

The genus *Hypocala* Guenee, 1852, comprises of 6 species. Holloway (1895) defined the morphology of the genus *Hypocala* robust with relatively narrow body, cryptically patterned forewing and flash coloration in yellow and black on the hindwing. The hindwing has a distinctive pattern in most species. In the present study the genus is defined by the correct palpi, triangularly scaled and rostriform. The most closely related species is *H. deflorata* to *H. rostrata* by the forewing but the

hind wing of *H. deflorata* can be differentiated from *H. rostrata* by the colour pattern of hindwing with the orange area; larger and marginal black area is reduced and orange spots conjoined. In *H. rostrata*, the hindwing orange area is not conjoined to a large spot at the end of the cell and with a marginal orange spot near anal angle. In *H. biarcuata* hindwing has orange marginal black band, broad at costa, and narrowing to anal angle. The only species in the genus *Hypocala* that can be readily separated from others is *H. lativitta*, hind wing with black cell-spot, prominent on underside. *H. violacea* differs from *H. subsatura*, the forewing irrorated with dark specks and hindwing a bar towards the anal angle.



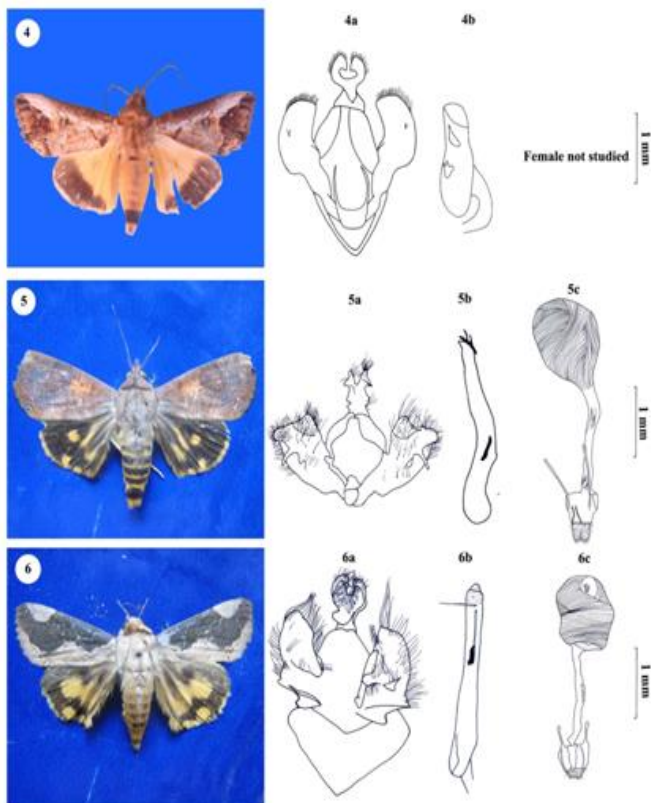
1. *Hypocala rostrata* Fabricius 1974, 1a. Male genitalia, 1b. Aedeagus, 1c. Female genitalia.

2. *H. biarcuata* Walker 1816, 2a. Male genitalia, 2b. Aedeagus, 2c. Female genitalia.

3. *H. deflorata* Fabricius 1794, 3a. Male genitalia, 3b. Aedeagus, 3c. Female genitalia. Scale: 1 mm.

Francy and George Mathew (2005-2006) studied the genital morphology of some species of the subfamily Ophiderinae. They defined the uncus as well developed in all the species of the subfamily Ophiderinae. Holloway (2005) characterised the genitalia of Genus *Hypocala* as the genitalia are unusual in structure. The uncus has highly complex in most species. The valvae deep, somewhat rectangular, with a variety of small lobes, spines and flanges. The juxta forms a ring round the anellus and is not of the inverted 'V' type unless that part has been shortened to a vestige. The aedeagus and vesica are variable. In the present study we observed the variations. Uncus was prominent: the shape and size varied in all species of subfamily Catocalinae. Uncus stout and curved in *H. rostrata*, *H. deflorata*, *H. violacea*, short in *H. subsatura*, beak-like in *H. lativitta* and *H. biarcuata*. Tegumen shoulder shape in *H. rostrata*, *H. deflorata*, *H. biarcuata*, *H. lativitta* Short in *H. subsatura*. Valvae was well developed in all the species of the genus *Hypocala*. Juxta was bowl shaped in *H. rostrata*, basket shaped in *H. lativitta*, highly sclerotized in *H. biarcuata* and cylindrical shaped in *H. rostrata*. Vinculum was long and 'V' shaped in *H. rostrata*, *H. deflorata*, *H. lativitta* and *H.*

subsatura, V- to U shaped in *H. biarcuata* and 'U' shaped in *H. violacea*. Aedeagus was somewhat broad in *H. rostrata*, *H. deflorata*, *H. biarcuata*; short and stout in *H. lativitta*, long and slender in *H. subsatura* and curved in *H. violacea*.



4. *H. lativitta* Moore 1877, 4a. Male genitalia, 4b. Aedeagus.

5. *H. violacea* Butler 1879, 5a. Male genitalia, 5b. Aedeagus, 5c. Female genitalia.

6. *H. subsatura* Guenee 1852, 6a. Male genitalia, 6b. Aedeagus, 6c. Female genitalia. Scale: 1 mm.

Francy and George Mathew (2005-2006) defined the female genitalia structure of the subfamily Ophiderinae. It varied in

shape and size. In the present study female genitalia ovipositor lobes were well developed in all species of the genus *Hypocala*. Corpus bursae was rounded in *H. rostrata*, oval shaped in *H. lativitta* and *H. violacea*, inferior in *H. biarcuata* and *H. deflorata*.

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